# Importance of pyrite as an arsenic sink in Bengal sediment

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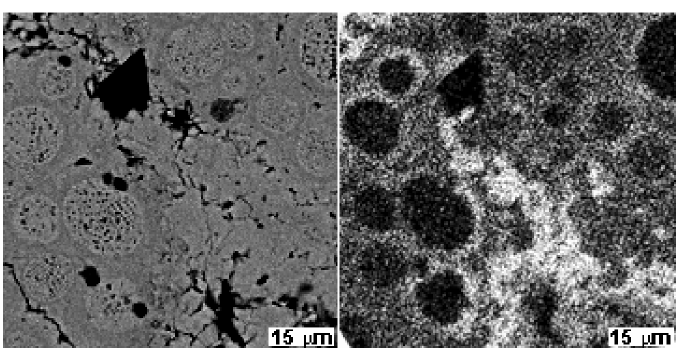
## Introduction

Processes that control the concentration of As in Bangladesh groundwater are under investigation. Pyrite in shallow and deep aquifer sediment are characterized to understand the importance of this diagenetic mineral as an As sink.

## Discussion of results

Pyrite framboids from depths <5 m contain 0.08-0.9 wt% As with an average value of 0.3 wt%. Framboids from sediment below 50 m generally contain less As (~0.2 wt%), but massive pyrite surrounding framboids contains ~0.5 wt% (Fig 1). S and As are strongly correlated in bulk compositions in deep sediment but appear to be independent in shallower sediment. $\delta^{34}S$ of pyrite in shallow sediments ranges from –11 to –0.4 ‰, while deeper samples range from –9 to 33 ‰.

Figure 1: Backscattered electron image (left) and x-ray map of As in pyrite (right). Brighter areas indicate more As.




## Conclusions

Pyrite is an important sink for As in some sediment in Bangladesh. The strong relation between S and As in deep sediments may reflect impact of seawater. Pyrite formation in shallow sediment may reflect the influence of fertilizer and could explain low dissolved As in very shallow wells.

## References

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# The medical geology and geochemistry of mineral deposits

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Medical geology and geochemistry use earth science methods and principles to help understand how geologic materials and processes may influence human health. A variety of health issues associated with mineral deposits, mineral resource development, and commercial and industrial mineral products have been recognized by the public health, regulatory, and mining communities for many years. These include, for example, health concerns associated with dusts of biodurable minerals such as asbestos and crystalline silica, which in sufficient dose can cause problems due to their longevity in the respiratory tract. Other health concerns can result from the uptake of bioaccessible metals or other potential toxicants from geologic materials (such as some mine wastes, soils affected by smelter emissions, etc.) that readily dissolve in gastrointestinal or respiratory tract fluids.

In some cases the links between particular mine sites and health problems (typically in the miners and mill workers, but more rarely also in workers' families and residents of nearby towns) are well-defined and documented. However, there are recent examples, particularly in developing countries, where a variety of illnesses have been publically attributed to the effects of nearby mine sites, but subsequent public health assessments have not found clear evidence of a link.

Earth scientists are playing a growing role in helping to define and understand potential health issues associated with mineral deposits. Mineralogical characterization of rocks mined from specific deposits helps determine the presence, form, abundance, and morphology of potential toxicants (i.e. asbestos, or minerals containing bioaccessible lead or other metals), and can be used to develop predictive models of mineral deposit types where such components may be present. Integrated geochemical leach tests (using simulated body fluids as the extracting fluids) and *in vitro* and *in vivo* toxicity tests of well-characterized ore, waste, and processing byproducts can help understand potential bioaccessibility and toxicity effects of toxicants upon exposure. Pre-mining human health baseline studies, likely to be commonplace in the future, will benefit from earth science information on possible geogenic sources of potential toxicants present in rocks, soils, dusts, and waters as a result of natural erosion and weathering of mineral deposits and host rocks.